What is claimed is:

1. A semiconductor device having a semiconductor layer, comprising:

a first impurity atom having a covalent bond radius larger than a minimum radius of a covalent bond of a semiconductor constituent atom of the semiconductor layer; and

a second impurity atom having a covalent bond radius smaller than a maximum radius of the covalent bond of the semiconductor constituent atom;

wherein the first and second impurity atoms are arranged in a nearest neighbor lattice site location and at least one of the first and second impurity atoms is electrically active.

2. The semiconductor device of claim 1, wherein at least one of the first and second impurity atoms is an acceptor or a donor for the semiconductor layer.

3. The semiconductor device of claim 1, wherein a doping concentration of one of the first and second impurity atoms is equal to or larger than an electrically active impurity concentration specific to the one of the first and second impurity atoms.

4. The semiconductor device of claim 1, wherein one of the first and second impurity atoms produces a deep impurity level near a middle of a band gap of the semiconductor layer when the first and second impurity atoms are arranged in a nearest neighbor

lattice site location.

5. The semiconductor device of claim 1, wherein the semiconductor layer is a Si layer, and the first and second impurity atoms are indium and boron.

6. The semiconductor device of claim 1, wherein the semiconductor layer is a Si layer, and the first and second impurity atoms are indium and carbon.

7. The semiconductor device of claim 2, wherein a doping concentration of one of the first and second impurity atoms is equal to or larger than an electrically active impurity concentration specific to the one of the first and second impurity atoms.

8. The semiconductor device of claim 2, wherein one of the first and second impurity atoms produces a deep impurity level near a middle of a band gap of the semiconductor layer when the first and second impurity atoms are arranged in a nearest neighbor lattice site location.

9. The semiconductor device of claim 2, wherein the semiconductor layer is a Si layer, and the first and second impurity atoms are

indium and boron.

10. The semiconductor device of claim 2, wherein the semiconductor layer is a Si layer, and the first and second impurity atoms are indium and carbon.

11. The semiconductor device of claim 3, wherein one of the first and second impurity atoms produces a deep impurity level near a middle of a band gap of the semiconductor layer when the first and second impurity atoms are arranged in a nearest neighbor lattice site location.

12. The semiconductor device of claim 3, wherein the semiconductor layer is a Si layer, and the first and second impurity atoms are indium and boron.

13. The semiconductor device of claim 3, wherein the semiconductor layer is a Si layer, and the first and second impurity atoms are indium and carbon.

14. A manufacturing method of a semiconductor device, comprising:

providing a semiconductor substrate;

doping a first impurity atom having a covalent bond radius larger than a minimum radius of a covalent bond of a semiconductor constituent atom of a semiconductor layer of the semiconductor substrate; and

doping a second impurity atom having a covalent bond radius smaller than a maximum radius of a covalent bond of the semiconductor constituent atom so as to be arranged in a nearest neighbor lattice site of the first impurity atom.

15. The manufacturing method of claim 14, wherein at least one of the first and second impurity atoms is an acceptor or a donor for the semiconductor layer.

16. The manufacturing method of claim 14, wherein a doping concentration of one of the first and second impurity atoms is equal to or larger than an electrically active impurity concentration specific to the one of the first and second impurity atoms.

17. The manufacturing method of claim 14, wherein the first and second impurity atoms are doped into the semiconductor layer by using an ion implantation.

18. The manufacturing method of claim 15, wherein a doping concentration of one of the first and second impurity atoms is equal to or larger than an electrically active impurity concentration specific to the one of the first and second impurity atoms.

19. The manufacturing method of claim 15, wherein the first and

second impurity atoms are doped into the semiconductor layer by ion implantation.

20. The manufacturing method of claim 16, wherein the first and second impurity atoms are doped into the semiconductor layer by ion implantation.